

dummy electrodes 6) is flush with the active portion, as shown in Figs. 3 and 5 of Japan (100). The inactive portion is not used for connecting the fingers of the active portion. As can be seen in Fig. 5 of the reference, an additional plate 15 is needed to support the structure, which would be otherwise, mechanically unstable. The same problem is noted in the Naka reference cited by the Examiner (see Fig. 1, where a plate 7 is added to hold the fingers together). The piezoelectric actuator of the present invention does not have this inconvenience. The dicing of the fingers is performed up to the inactive area of the piezoelectric body, and a stable piezoelectric unit is directly obtained.

There is no need for an additional supporting unit. Neither Japan (100) nor Naka describes an inactive portion disposed between the active portion and the top face of the block body of piezoelectric material, in order to avoid the use of an additional support plate. Therefore, a person skilled in the art would not find in the Japan (100) or Naka references a solution to the problem of using an additional plate. The piezoelectric actuator of new claim 1 provides an inventive solution to the problem present in the prior art.

4 [ The Examiner refers to Fig. 4 of the present application to reject the claim as being obvious. However, Fig. 4 merely shows a printhead with a conventional actuator, which cannot be considered as prior art to the present application unless the Examiner can provide evidence that this actuator was disclosed before the priority date of the present application. ] Even if, arguendo,

Fig. 4 was known before the priority date of the present application, the combination of the closest prior art Japan (100) with the inactive area 38 of the actuator of Fig. 4, would not have been obvious to a person skilled in the art desiring to solve the problems of the need for an additional support plate. In Japan (100) the displacement of the fingers in actuation is along the length direction of the fingers. In an inactive area, as shown in Fig. 4, were disposed between the active portion and the top face of the block body of Japan (100), connecting the fingers, the actuation of the fingers would be impaired. Therefore, a person skilled in the art would not have thought to provide an inactive area between the active portion and the top face of the block body for connecting the fingers.

The displacement of the fingers, according to the present invention, is in a direction substantially normal to the electrodes. The actuation of the fingers is therefore not impaired by the fact that the inactive portion is disposed between the active portion and the top face of the block body. Accordingly, it would not have been obvious for one skilled in the art to obtain a piezoelectric actuator as recited in claim 1, by combining the documents cited by the Examiner. Since claims 3-5, 7, 9 and 10 are dependent claims, it is believed that these claims should be considered allowable for the same reasons as the independent claims.

Accordingly, in view of the above amendments and remarks, reconsideration of the rejections and allowance of all the claims of the present application are respectfully requested. In the event that the proposed amendment does not place the present application into condition for allowance, entry thereof is respectfully requested as placing the present application into better condition for Appeal.

### **Conclusion**

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

In the event there are any matters remaining in this application, the Examiner is invited to contact Mr. Joseph A. Kolasch, Registration No. 22,463 at (703) 205-8000 in the Washington, D.C. area.

Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), the Applicant respectfully petitions for a one (1) month extension of time for filing a response in connection with the present application and the required fee of \$110.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or

1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By: 

Joseph A. Kolasch  
Reg. No. 22,463

JAK/clb

P. O. Box 747  
Falls Church, VA 22040-0747  
(703) 205-8000

Enclosure: Marked Up Version of Claim Amendments



## **MARKED UP VERSION OF AMENDMENTS**

### **IN THE SPECIFICATION**

**Please amend the Specification to read as follows:**

#### **Page 3**

**Replace the paragraph beginning at line 24-30, with the following new paragraph:**

The signal lead electrodes 42 and the ground lead electrode 44 are connected to respective contact electrodes 50 and 42-52' formed on the bottom face 26 of the body 24. The contact electrode 52 extends beyond the rear ends of the ink channels 18. All the contact electrodes 50 and 52 are electrically connected to a control circuit (not shown) via electrical leads formed on a connecting piece 54. The connecting piece 54 is formed by a flexible foil which is sandwiched between the bottom face 26 of the body 24 and the receiving member 22 below the inactive part 36.

### **IN THE CLAIMS**

**Please amend the claims to read as follows:**

1. (Twice Amended) A piezoelectric actuator for an ink jet printhead, comprising:

- a block body of piezoelectric material having a bottom face through which the mechanical energy of the actuator is transferred to a receiving member, said body having an active portion adjacent to the bottom face as well as an inactive portion disposed between said active portion and a top face of

said block body;

- a layered structure of alternating signal electrodes and common electrodes arranged in the active portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, wherein each signal electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one signal electrode;

- a layered structure of alternating auxiliary electrodes and common electrodes arranged in the inactive portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, wherein each auxiliary electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one auxiliary electrode;

- at least one signal lead electrode formed on a first side face of said block body of piezoelectric material and interconnecting the signal electrodes;

- a ground lead electrode formed on a second side face opposite to the first side face and interconnecting the common electrodes;

- and an auxiliary lead electrode interconnecting the auxiliary electrodes, wherein the auxiliary lead electrode is formed on a third side face of the block body, wherein the active portion is divided into a plurality of fingers arranged in parallel to one another and integrally connected with each other by the said inactive portion of the block body.

11.— (Amended) A piezoelectric actuator for an ink jet printhead, comprising:

a block body of piezoelectric material having a bottom face through which the mechanical energy of the actuator is transferred to a receiving member, said body having an active portion adjacent to the bottom face as well as a first inactive portion disposed between said active portion and a top face of said block body and a second inactive portion adjacent to a portion of the bottom face;

a layered structure of alternating signal electrodes and common electrodes arranged in the active portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, wherein each signal electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one signal electrode;

a layered structure of alternating auxiliary electrodes and common electrodes arranged in the first inactive portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, wherein each auxiliary electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one auxiliary electrode;

at least one signal lead electrode formed on a first side face of said block body of piezoelectric material and interconnecting the signal electrodes;

a ground lead electrode formed on a second side face opposite to the first

side face and interconnecting the common electrodes;

and an auxiliary lead electrode interconnecting the auxiliary electrodes, wherein the auxiliary lead electrode is formed on a third side face of the block body, and wherein the block body comprises a second inactive part adjacent to a portion of the bottom face.

12.—(Amended) An ink jet printhead containing a piezoelectric actuator, said piezoelectric actuator comprising:

a block body of piezoelectric material having a bottom face through which the mechanical energy of the actuator is transferred to a receiving member, said body having an active portion adjacent to the bottom face as well as an inactive portion disposed between said active portion and a top face of said block body;

a layered structure of alternating signal electrodes and common electrodes arranged in the active portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, wherein each signal electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one signal electrode;

a layered structure of alternating auxiliary electrodes and common electrodes arranged in the inactive portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, wherein each



auxiliary electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one auxiliary electrode;

at least one signal lead electrode formed on a first side face of said block body of piezoelectric material and interconnecting the signal electrodes;

a ground lead electrode formed on a second side face opposite to the first side face and interconnecting the common electrodes;

and an auxiliary lead electrode interconnecting the auxiliary electrodes, wherein the auxiliary lead electrode is formed on a third side face of the block body, and wherein at least one ink channel terminates in a nozzle and is covered by a flexible receiving member, said piezoelectric actuator being bonded to said flexible receiving member.